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ABSTRACT This paper discusses the Financial Analysis System (FAS), a software system for financial analysis, display, and modeling of the data found in the COMPUSTAT Annual Industrial, Over-the-Counter and Canadian Company files. The educational utility of FAS is also discussed briefly. (Author)

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THE FINANCIAL ANALYSIS SYSTEM: AN INTEGRATED SOFTWARE
SYSTEM FOR FINANCIAL ANALYSIS AND MODELING

by

S. Michael Groomer

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THE FINANCIAL ANALYSIS SYSTEM: AN INTEGRATED SOFTWARE
SYSTEM FOR FINANCIAL ANALYSIS AND MODELING

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During the past fifteen years there has been an emergence of many large machine readable data bases. These data bases have been complemented by the tremendous advancements in computer technology and the utilization of automated procedures for financial analysis and display. Moreover, there is an ever increasing trend toward the utilization of computer-based financial data analysis in the educational curriculum, as well as for financial and industrial concerns.

There are, however, several factors which limit the role of the computer in concert with these data bases as a standard part of the curriculum. While there is a widespread utilization of computer based analyses and modeling in academic research, the same is not true for general classroom instruction and teaching methods. This is due, in part, to inadequate resources such as computer hardware, software and technical support. In addition, students enrolled in courses which treat the fundamentals are seldom able to make use of computer based methods due to their limited or non-existent background in computer programming, computer applications and statistical methods.

A number of generalized statistical packages, such as the Statistical Analysis System (SAS) or the Statistical Package for the Social Sciences (SPSS) have removed some of the barriers associated with student utilization of large data bases. In nearly all cases, however, the desirable display, analysis and modeling capabilities are not directly available. Examples of these deficiencies would include financial statements and comparative analyses. Moreover, there are significant staff requirements necessary to develop, operate and maintain associated data, particularly in the situation where multiple large data bases are utilized. Certainly, there is a need to implement generalized software specifically directed toward the larger and more significant financial data bases.

One such software package recently available for use with the COMPUSTAT¹ financial data is the Financial Analysis System. Thus, the purpose of this paper is to describe the Financial Analysis System (FAS)² in facilitating effective utilization of the COMPUSTAT data base in the classroom environment.

FAS AND ITS ORIGINS

FAS is a batch-oriented, modular software package of analytical modeling and display routines designed to facilitate the effective utilization of the COMPUSTAT data files. Although relatively new, FAS is being implemented at both academic and commercial installations. The COMPUSTAT data service consists of a number of machine readable libraries of financial, market and statistical information covering several thousand industrial and non-industrial companies. The data is available via lease agreement from Standard and Poor's Compustat Services, Inc. on an annual, quarterly or monthly update basis. Data on the largest and most significant companies listed on the New York, American and Regional Stock Exchanges as well as Canadian companies are available. In addition to broad company coverage, the annual industrial files contain detailed key balance sheet, income statement and market items by individual companies. FAS may be used to access annual data found on the Primary, Supplementary, Tertiary, Over-the-Counter and Canadian Files.

FAS is a software product of the Public Affairs Information Service (School of Business and Public Administration) of the University of Missouri-Columbia and is currently under exclusive license to Management System Developments, Inc. FAS was developed at Missouri after three years of experience and support of several programs developed for use with the COMPUSTAT data which had specific and limited capabilities and required a reasonable amount of computer expertise to use. Thus, FAS arose out of a need to have a broadly based piece of software for display and analysis of COMPUSTAT data which could be more easily utilized, maintained and enhanced.

OPERATIONAL CHARACTERISTICS

FAS is written in a highly portable set of FORTRAN IV consisting of approximately 11,500 lines of code and has been successfully executed on IBM, CDC, UNIVAC and BURROUGHS mainframes. Because of its size, FAS has been overlayed at a majority of the installation sites. Moreover, most implementers have found catalog procedures very helpful in facilitating user access to this software.

Communicating with FAS is easily accomplished via two types of user control cards: procedure cards and request cards. Key word procedures are used to tell FAS which display or analytical routines are to be used. The request cards indicate which companies in the data file are to be selected for processing. Procedure cards and related request cards comprise a request set. One or more request sets may be processed in a given job. The procedures currently available through FAS are summarized on the next page.³

COMPUTE: The COMPUTE procedure enables the user to create user defined variables. These can be single variables (scalars) or time-series variables (vectors). Using built-in functions, the user can compute the mean, standard deviation, geometric growth rate, and arithmetic growth rate for time-series variables.

AVG: The AVG procedure computes and displays average industry ratios from a set of 30 predefined ratios.

GROUP: The GROUP procedure instructs FAS to aggregate all of the COMPUSTAT data items for the requested companies. This allows the user to create industry or composite type data.

INPUT: The INPUT procedure enables the user to merge non-COMPUSTAT data with data from the COMPUSTAT files. For example, economic data such as GNP, or additional company data can be read in and used in subsequent computations.

LIST: The LIST procedure instructs FAS to print all or part of the data for the requested companies in a tabular form. Through the use of the ITEMS and YEARS parameters, the user can select specific items or years. If neither ITEMS nor YEARS is specified, all items for the last ten years are printed in an organized data list format--all items grouped by type; i.e., income statement, balance sheet, etc.

OUTPUT: The OUTPUT procedure enables the user to write out, to any peripheral device, user specified data in a user specified format. For example, computed variables such as ratios along with COMPUSTAT data items could be written onto another file to be processed by other user software.

PLOT: The PLOT procedure produces a two-dimensional plot of two user specified variables. The number of rows can be controlled with a ROWS parameter up to a maximum of fifty rows.

PUNCH: The PUNCH procedure enables the user to write to an auxiliary device, an eighty column character record,--normally directed to a card punch. This procedure does not require a user specified format and is provided as a convenience to the non-programming user.

RATIOS: The RATIOS procedure is used to request the default set of 30 predefined financial ratios or a user specified subset. Liquidity ratios, asset ratios, efficiency-ratios, profitability ratios, and leverage ratios comprise the 30 predefined ratios.

RECORD: The RECORD procedure is similar to the PUNCH procedure; however, the data record is written in binary (via an unformatted FORTRAN WRITE).

REGR: The REGR procedure allows the user to estimate multiple regression models using ordinary least squares. The correlation matrix and related descriptive statistics can optionally be printed.

REPORT: The REPORT procedure is used to generate any one of three standard reports to display user specified data. Report layouts provide flexibility for the display of data for multiple years, data items, and companies.

SCREEN: The SCREEN procedure enables the user to select companies based upon user specified criteria. Examples would be selecting only those companies from an industry that had sales in specified years greater than a given amount, selecting companies that had a P/E ratio in the latest year greater than a user specified value.

STATEMENTS: The STATEMENTS procedure is used to generate income statements, balance sheets, and/or source and use of funds statements for specified years for the requested companies.

TITLE: The TITLE procedure permits the user to print an 80 character title at the top of each page of the FAS output.

TREND: The TREND procedure instructs FAS to prepare a trend analysis on a predefined set of variables or a user specified set of variables. The trend is estimated using ordinary least squares. Both a linear trend and compound growth rate model are estimated for the requested variables.

These procedures can be qualified for greater flexibility, through the use of keyword parameters. For example, YEARS is used to specify a specific year or years for time series variables.

In order to make effective use of FAS, the user must be familiar with the annual data record found on the industrial file(s). An individual company record contains the following information.

1. Industry Number
2. CUSIP Company Number (Issuer Code)
3. CUSIP Issue Number and Check Digit
4. File Identification Code
5. Exchange Listing and S&P Index Code
6. Industry Name (Alphabetic Field)
7. Company Name (Alphabetic Field)
8. Stock Ticker Symbol (Alphabetic Field)
9. Fiscal Year End Month of Data for Each of 20 Years
10. Data Year
11. Special Treatment Footnote Code for Each of 20 Years
12. Update Code (0,1,2 or 3)
13. Annual Footnotes. Data Array of 35 Footnotes for 20 Years
14. Data Array of 135 Items for 20 Years

FAS reads the entire record for each company requested. The user can address selected parts of this record through the use of reserved words. For example, the data matrix is accessed with the reserved word D. Thus, a specific item for a specific year would be D(2,75), indicating that the second data item for 1975 is desired for utilization in any of the respective procedures.

The ability of the user to display a significant portion of the data as well as many related relationships is best exemplified in the "default output." This output is a thirteen page listing, part of which is presented in Figure 1, and consists of the following:

- A. Organized Data List. The organized data list contains all 135 data items plus 13 derived items for the last ten years.
- B. Ratio Analysis. Here FAS computes 30 predefined ratios.
- C. Trend Analysis. FAS computes least squares trend for a selected set of items and ratios.

Moreover, the user need provide only a request card (no procedure cards) to secure this default output.

The ability to organize this data via financial statements is an important part of any financial analysis. The user may easily generate financials with the (STATEMENTS) procedure. Industry composites, which would take days to collect and compute, are easily provided by AVG or user supplied COMPUTES, GROUPS and SCREENS. This is a further indication of the flexibility of FAS.

For the user who wishes to undertake modeling applications, REGRESSION and TREND are available. REGRESSION, for instance, provides extensive distributional analysis for each parameter. In addition, the I/O capabilities afforded by RECORD, INPUT, and OUTPUT provide very easy access by FAS to foreign data or to make available COMPUSTAT data for processing by other software systems.

EDUCATIONAL UTILITY OF FAS

In the academic community, the display, analytical modeling and I/O capabilities of FAS seem generally sufficient to make frequent and effective use of the COMPUSTAT data base. Although there is an increasing trend toward more available and up-to-date computer resources at the larger colleges and universities, this is not true in all instances. However, users of FAS would find it very desirable to have additional capabilities which include a prompting, conversational form for interactive use and extend FAS so that it could address the quarterly data files as well.

The increased availability and usability of software systems like FAS in concert with large data bases suggests that students with potential careers in business, particularly in accounting and finance, should indeed be exposed to this type of software and data. Recall that FAS is being utilized in commercial as well as academic circles. It is unlikely that any interest in the utilization of computer based methods will follow students into their careers unless they have been academically exposed. Moreover, the ever increasing utilization of both time-sharing and computer service vendors for data analysis, modeling and evaluation suggests a corresponding activity in the educational curriculum.

TITLE A DEFAULT LISTING OF BOISE CASCADE CORP.,
002400.097383

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 COPYRIGHT MAY 1978 - MSD, INC. A DEFAULT LISTING OF BOISE CASCADE CORP.
 INDUSTRY NAME: LUMBER & WOOD PRODUCTS COMPANY NAME: BOISE CASCADE CORP
 INDUSTRY NUMBER: 2400 COMPANY NUMBER: 97383
 FILE CODE: PRIMARY INDUSTRIAL FILE AND S&P 425 INDEX
 EXCHANGE LISTING AND S&P INDEX CODE: NYSE AND IN THE S&P 425 INDEX
 *** FOOTNOTES *** THERE ARE SPECIAL TREATMENT FOOTNOTES FOR THIS COMPANY
 YEAR: 57
 FOOTNOTE NUMBER: 3

MOD 0

TICKER SYMBOL: BCC
 CUSIP ISSUE NUMBER: 103

ORGANIZED DATA LIST
 =====

*** BALANCE SHEET ITEMS - ASSETS ***

YEAR	END OF FISCAL YEAR	1 CASH MMS	2 RECEIVABLES MMS	67 RECEIVABLES (ESTIMATED DOUBTFUL) MMS	3 INVENTORIES MMS	76 RAW MATERIALS MMS	77 WORK IN PROCESS MMS	78 FINISHED GOODS MMS
67	DECEMBER	18.1000	88.0000	.0001	97.9000	.0001	.0001	.0001
68	DECEMBER	10.5000	95.7000	.0001	112.2000	.0001	.0001	.0001
69	DECEMBER	90.5430	228.4330	2.4720	161.3650	85.9370	.0001	.0001
70	DECEMBER	97.7530	219.9580	2.5660	167.3180	86.4990	.0001	.0001
71	DECEMBER	78.9410	214.8380	5.0300	194.9280	102.3640	.0001	.0001
72	DECEMBER	71.2670	170.1960	2.8750	180.4100	95.9560	.0001	.0001
73	DECEMBER	186.7510	141.4060	2.8000	195.7250	103.1230	.0001	.0001
74	DECEMBER	92.6720	129.7350	2.7810	248.6220	145.9480	.0001	.0001
75	DECEMBER	34.0710	140.0770	2.6090	261.8520	151.4610	.0001	.0001
76	DECEMBER	105.2860	204.6750	2.2330	313.3260	174.8370	.0001	.0001

YEAR	68 CURRENT ASSETS (OTHER) MMS	4 CURRENT ASSETS (TOTAL) MMS	7 PLANT-GROSS MMS	8 PLANT-NET MMS	73 CONSTRUCTION IN PROGRESS (NET) MMS	31 INVESTMENTS IN AND ADVANCES TO SUBS. MMS	32 INVESTMENTS IN AND ADVANCES TO OTHERS MMS	33 INTANGIBLES MMS
67	.0000	204.0000	563.9000	403.3000	.0001	11.2320	31.5730	.0000
68	.0000	218.4000	554.4000	363.4000	.0001	48.8920	26.6970	.0000
69	.0000	480.3410	844.2820	560.7310	.0000	81.2790	265.2600	.0000
70	.0000	485.0290	948.0570	641.4470	.0000	.0000	300.6370	.0000
71	.0000	488.7070	1040.7260	702.9410	.0000	.0000	271.2920	.0000
72	83.4290	505.3020	907.4320	585.1830	.0000	55.9660	159.1920	.0000
73	.0000	523.8820	891.2700	560.8240	.0000	67.7850	84.3640	.0000
74	.0000	471.0290	1016.9840	655.5680	.0000	76.8400	70.0050	.0000
75	.0000	436.0000	1169.1870	765.4240	.0000	81.1290	58.0740	.0000

LIQUIDITY RATIOS

YEAR	FISCAL YEAR MONTH	1 CURRENT RATIO	2 ACIO TEST RATIO	3 CASH TURNOVER	4 RECEIVABLE TURNOVER	5 INVENTORY TURNOVER	6 SALES PER \$ WORKING CAPITAL
67	DECEMBER	1.6361	.8509	42.4972	8.7409	7.8570	9.6980
68	DECEMBER	1.6012	.7786	97.7619	10.7262	9.1488	12.5177
69	DECEMBER	1.5021	.9975	19.0606	7.5550	10.6950	10.7480
70	DECEMBER	1.9295	1.2639	17.5632	7.8054	10.2611	7.3479
71	DECEMBER	1.6179	.9726	22.6228	8.3126	9.1617	9.5681
72	DECEMBER	1.2754	.6094	16.1491	6.7622	6.3794	10.5491
73	DECEMBER	1.6971	1.0630	7.0919	9.3661	6.7667	6.1548
74	DECEMBER	1.6533	.7806	15.6849	11.2040	5.8464	7.8096
75	DECEMBER	1.4336	.5726	42.7945	10.4089	5.5682	11.0570
76	DECEMBER	2.0917	1.0402	18.3456	9.4371	6.1646	5.9377

ASSET RATIOS

EFFICIENCY RATIOS

YEAR	7 CASH/ TOTAL ASSETS	8 RECEIVABLES/ TOTAL ASSETS	9 INVENTORY/ TOTAL ASSETS	10 INTANGIBLES/ TOTAL ASSETS	11 EARNING POWER	12 PROFIT MARGIN	13 SALES TURNOVER
67	.0209	.1017	.1132	.0000	5.7854	10.8450	1.5938
68	.0102	.0931	.1092	.0000	3.5224	12.3186	2.3046
69	.0456	.1151	.0813	.0000	4.2986	9.7230	2.3926
70	.0431	.0970	.0738	.0000	9.0431	5.6365	1.9619
71	.0360	.0979	.0888	.0000	154.4425	.3225	2.0075
72	.0400	.0955	.1012	.0000	5.0584	11.9258	1.6577
73	.1178	.0892	.1235	.0000	3.7314	15.7025	1.7067
74	.0588	.0823	.1578	.0000	3.9143	14.7934	1.7269
75	.0217	.0892	.1668	.0000	5.9161	10.4022	1.6249
76	.0608	.1182	.1810	.0000	5.4249	11.7094	1.5743

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PER SHARE DATA RATIOS

YEAR	25 PRICE/ EARNINGS	26 DIVIDEND YIELD	27 DIVIDEND PAYOUT	28 CASH FLOW PER SHARE	29 PRICE/ CASH FLOW	30 COMMON STOCK HOLDER EQUITY
67	20.6250	.6109	10.4512	3.8056	10.0139	8.5828
68	27.2584	.3823	7.7745	4.0041	15.2678	15.6083
69	29.5543	.3226	19.4870	3.9126	18.7315	26.8567
70	39.8707	.5405	21.1084	2.6756	16.9471	27.9915
71	-15.6250	1.3333	-20.5021	4.705	43.5491	25.2637
72	8.6240	1.1236	9.7072	2.6574	4.1864	19.6538
73	4.7578	.9164	4.3247	4.5345	3.0323	24.5731
74	2.9915	4.1619	12.4903	5.1615	2.0343	27.6864
75	10.9375	2.5905	28.3606	4.0708	5.8036	29.2575
76	10.1894	2.2662	23.1267	5.7536	5.8442	31.9029

TREND ANALYSIS

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THE DEPENDENT VARIABLES ARE REGRESSED OVER THE FOLLOWING YEARS: 67 68 69 70 71 72 73 74 75 76

ESTIMATE OF LINEAR TREND MODEL $Y=A+BT$

ESTIMATE OF THE ANNUAL COMPOUND GROWTH MODEL $E = E_0(1+G)^T$

DEPENDENT VARIABLE (Y)	SLOPE (B)	Y INTERCEPT (A)	CORRELATION COEFFICIENT (R)	GROWTH FACTOR (G)	Y INTERCEPT (A)	CORRELATION COEFFICIENT (R)	FIRST YEAR VALUE	LAST YEAR VALUE
EARNINGS PER SHARE	.1539	1.1194	.3433	.0001	.0001	.0001	.0001	.0001
NET PROFIT TO COMMON	7.0747	14.7961	.5070	.0001	.0001	.0001	.0001	.0001
NET SALES	62.4744	1090.6586	.5101	.0539	6.9449	.5521	1093.8603	1754.9557
DIVIDEND PER SHARE	.0481	.0616	.6885	.1139	-1.8818	.5455	.1697	.4478
AVERAGE MARKET PRICE	-4.3592	56.9004	-.7081	-.1227	4.0052	-.5679	48.1495	14.8233
BOOK VALUE PER SHARE	1.6579	14.9501	.7242	.0908	2.6507	.7057	15.4506	33.7766
CASH FLOW PER SHARE	.1610	2.8924	.3232	.0448	.9299	.1771	2.6479	3.9296
P/E RATIO	-2.5580	27.9874	-.4879	.0001	.0001	.0001	.0001	.0001

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PROFITABILITY RATIOS

YEAR	14 RETURN ON COMMON EQUITY	15 EARNINGS/ ASSETS	16 EARNINGS/ SALES	17 NET INCOME/ TOTAL ASSETS	18 NET INCOME/ TOTAL INVESTED CAPITAL
67	20.5938	.0850	.0956	.0328	.0490
68	15.2448	.1152	.1154	.0442	.0740
69	8.8631	.0803	.0923	.0383	.0605
70	3.9806	.0453	.0598	.0156	.0257
71	-4.7531	.0087	.0107	-.0169	-.0286
72	6.5494	.0734	.1137	.0226	.0354
73	12.4200	.1181	.1413	.0569	.0828
74	12.6636	.1190	.1290	.0658	.0908
75	7.3933	.0751	.0808	.0407	.0538
76	10.3289	.1073	.0961	.0562	.0708

LEVERAGE RATIOS

YEAR	19 LONG TERM DEBT/ TOTAL ASSETS	20 LONG TERM DEBT/ INV. CAPITAL	21 FIXED CHARGE COVERAGE	22 CASH FLOW/ TOTAL DEBT	23 WORKING CAPITAL/ TOTAL ASSETS	24 MKT. VALUE OF EQUITY/ TOTAL DEBT
67	.3620	54.0939	3.7673	.1476	.0917	1.4784
68	.2459	41.1890	4.5827	.2810	.0798	4.2905
69	.2000	31.2674	4.0494	.2788	.0809	5.2214
70	.2152	35.0361	1.9206	.1547	.1030	2.6215
71	.2310	38.5316	.0304	.0225	.0851	.9800
72	.2936	45.5896	3.0583	.1256	.0612	.5258
73	.2268	32.7412	8.1275	.3323	.1357	1.0076
74	.2028	27.8740	9.2500	.4054	.1181	.8246
75	.2043	26.9497	5.4526	.3047	.0840	1.7683
76	.2475	31.1216	5.7599	.3569	.1879	2.0860

25

FOOTNOTES

1. COMPUSTAT is a registered trademark of Standard and Poor's Compu-stat Services, Inc. and is used to represent a set of proprietary data products, produced and marketed by Standard and Poor's Compu-stat Services, Inc.
2. For a more extensive description, see Carl E. Ferguson and Warren G. Glimpse, Financial Analysis System - User's Guide, Management System Developments, Inc., 1978.
3. Reproduced from the FAS manual with permission.

REFERENCES

Ferguson, Carl E. and Warren G. Glimpse. Financial Analysis System - A User's Guide. Management System Developments, Inc., 1978.